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# Improving Storage *Technique* Coffee Green Beans and Application of Digital Management Business in "Tri Guna Karya" Catur Village, Kintamani, Bangli

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A B S T R A C T

Coffee is the most popular and traded drink in the world. The cultivar, environmental conditions, and agricultural management determine the physical quality, coffee taste, and chemical composition of coffee beans. The purpose of this community service was to enhance the knowledge and skills of the Triguna Karya group in green bean storage techniques, thereby maintaining the quality and safety of the green beans. Moreover, to enhance the marketing strategy by leveraging multiple social media platforms. The method used was survey, observation, mentoring, knowledge transfer, practice, documentation, and evaluation. The result showed that the Triguna Karya group stored green coffee beans poorly in the warehouse, despite their knowledge of postharvest handling and coffee processing. The group did not use temperature and humidity control during green bean storage; therefore, they may be damaged, leading to reduced quality and safety. In general, the participants have understood Facebook, but less so how to use Instagram and TikTok.

**Contribution to Sustainable Development Goals (SDGs):**

**SDG 2: Zero Hunger**
**SDG 12: Responsible Consumption and Production**
**SDG 8: Decent Work and Economic Growth**

## 1. INTRODUCTION

### *1.1. Background*

Food is the most basic human need, and its realisation is a human right for every Indonesian. Meeting the need for sufficient, high-quality food is the hope of all communities. The fulfilment of food ingredient requirements cannot be assessed solely by quantity; they must also meet quality and safety requirements. Improving product quality can be achieved by using high-quality raw materials, improving processes, and evaluating final quality.

The physical quality, coffee taste, and chemical composition of coffee beans are determined by the cultivar, the environmental conditions, and agricultural management [1]; [2]. According to [3] & [4], post-harvest processing is a key factor in achieving high coffee quality. Coffee is one of the most traded commodities and popular drinks nowadays, as well as the most widely consumed and traded beverage in the world after water, due to its characteristic aroma and psychoactive effects [5];[6];[7];[8];[9].

Bali, one of the world's most famous tourist destinations, is also known for its coffee, with unique flavours and characteristics. The types of coffee commonly found in Bali are Arabica and Robusta. These two types of coffee grow in different regional conditions and are influenced by soil type, temperature

and humidity, altitude, and maintenance methods. Arabica coffee is widely grown in areas with altitudes above 800 meters above sea level. Several regencies in Bali produce Arabica coffee, namely Bangli, Badung, Buleleng and Tabanan.

Marketing coffee is the prime and last activity in the coffee production chain. Marketing depends on many factors, such as demand, international market prices, consumer preferences, and trade barriers (Figure 1.1), which are discussed below. Coffee supply and marketing also face different challenges, such as high production costs and associated pricing, competition from other coffee-growing countries, intrinsic coffee quality, consumer preferences, and contaminants in the produce. Quality is the most critical factor that determines coffee prices in the international market. In general, coffee quality is assessed through visual (moisture, size, colour, roast quality, presence of defects, foreign matter etc.) and organoleptic (body, acidity and aroma) qualities. [10] (Velmourougane and Bhat, 2017). [11]. Marketing is an important part of business development. According to [12], the most difficult challenge in marketing is maintaining consumer confidence in the products they purchase. Digital marketing is a marketing activity that helps products or services become better known to potential consumers and, at the same time, influences potential buyers to purchase and consume company products and services through the Internet [13];[14]. [15] found that digital marketing has a positive, significant effect on sales performance. According to [16], e-commerce is a recent trend that has become a marketing strategy, leveraging technology to reach a wider audience than conventional marketing. The use of social media, especially Instagram, in marketing coffee beverage products has proven effective for quickly and cost-effectively spreading promotional messages to customers, compared to traditional media [17].

According to [18];[19];[20], a marketing strategy is a plan to achieve organisational goals in marketing. In other words, marketing strategy is a set of goals and objectives, policies, and rules that give direction to the company's marketing efforts over time, at each level, and for reference and allocation, especially as the company responds to the environment and competitive conditions.

### *1.2 Objective*

This Community Service (PKM) has some objectives, such as 1) increasing the knowledge and skills of management and members of the Triguna Karya group in the field of green bean storage techniques and 2) improving the capability and skills in managing a digital-based coffee business.

## 2. MATERIALS AND METHODS

### *2.1. Materials*

The method used to implement community partnership service activities was mentoring and counselling, with a focus on strengthening the Triguna Karya Group's human resource capacity. The mentoring activities carried out include: 1) observation and interviews, 2) knowledge transfer and discussion, 3) practice, and 4) documentation.

The implementing step of community service activities that will be carried out are follow:

1. Surveys, observations and interviews
2. Identify the problem
3. Determining solutions to overcome the problems
4. Implementation of activities.
5. Providing theory, discussion and practice
6. Evaluation of activities and results

This Community Services activity was conducted from June to September 2024.

### *2.2. Community Service Implementation*

According to the problems identified there are two problems were found such as 1) luck of knowledge and skills of the group farmers regarding proper and correct storage techniques of green beans, and 2) the Triguna Karya group have not sufficient knowledge and skills in carrying out digital- based business management. Regarding the problems in the group, two solutions were offered to the group, namely:

#### *2.1.1. Transfer of knowledge and skill*

The group farmer's knowledge and skills can improve by addressing both weaknesses through providing theory and training in good storage practices and digital business management. The first step was for the participants to provide a theory on two topics related to problem solutions.

#### *2.1.2. Improving storage technical method of coffee beans*

Most farmer groups store green beans in warehouses that do not meet SOP (standard operating procedure) requirements. This condition was also found in the Triguna Karya group in Catur Kintamani Village, Bangli. The group already has experience storing green beans, but this experience is not based on research studies, so the process stages, especially the storage stage, do not meet standards. This can be seen in the condition of the storage room (warehouse), which is not equipped with appropriate temperature and humidity controls for storing green beans. Furthermore, the storage time is not known with certainty, even though storage will cause changes and a decrease in green bean quality. The business management carried out so far by the Triguna Karya Group is still mostly conventional, slowing business development.

Based on the weaknesses mentioned above, in this community service activity, groups will be introduced to effective green bean storage techniques, thereby reducing the quality and damage to green beans. The results of several studies found that storing green beans at room temperature (27-30 °C) for 5 weeks still maintains good quality. In this condition, green beans are packaged in Al foil with low permeability to air and water vapour. The recommended storage room temperature is 27-30 °C. Under these storage temperature conditions, green beans still have good quality in terms of water content, caffeine, chlorogenic acid, protein and reducing sugar.

To maintain the quality of green beans and ensure their safety during storage at room temperature, the coffee-handling stages must be carried out in accordance with standard operating procedures (SOPs) that have been tested and approved. The stages of implementing post-harvest coffee science and technology, especially at the storage stage, include:

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### *2.1.3. Harvesting of coffee cherries*

The coffee fruit used is ripe Arabica coffee fruit with red skin. The coffee cherries were harvested in field at Triguna Karya group. Harvesting coffee cherries must be done properly. Poor harvesting of coffee cherries, especially the level of maturity, can affect the quality of coffee products.

*Sortation*

Sorting is the process of selecting coffee cherries to obtain good (superior) raw materials.This process aimed to separate red, yellow, and green coffee cherries from damaged coffee cherries, dirt, or other foreign materials. The superior coffee cherries used are red, undamaged, and not damaged.

*Washing*

Washing the sorted red coffee cherries is done using clean water. The washing process aims to remove dirt from the coffee cherries' surfaces and foreign objects such as small stones, soil, twigs, and leaves.

*Weighing of coffee cleaned*

The coffee cherries to be used are weighed at 100 kg. Weighing is performed to determine the initial weight of the whole coffee cherries before peeling.

*Pulping*

The outer skin of the coffee cherries was removed using a pulper. The outer skin of the coffee cherries was stripped by inserting the coffee into a pulper machine and adding clean water, making the peeling easier and faster. Removing the skin improved the fermentation and drying processes of coffee beans, making them better and quicker.

The outer skin of the coffee cherries was weighed again to determine the final weight of the material to be used and the total skin waste.

*Fermentation*

Fermentation is carried out using a dried process. Coffee beans without the outer skin still contain mucus, which cannot be removed by washing. The main purpose of this fermentation process is to make it easier to remove the mucilage layer attached to the surface of the coffee beans. Moreover, fermentation aims to form potential flavour-forming compounds as precursors and can increase the content of bioactive compounds beneficial to health. Fermentation is carried out by placing the coffee beans in a dry container (sack) and fermenting at 30 ± 2 °C for 36-48 hours. During fermentation, the temperature must be controlled and maintained at an appropriate level to keep it stable. The fermentation process is one of the most important keys in the coffee processing.

*Washing*

After fermentation, the coffee beans were washed again to remove the mucus adhering to their surfaces. Washing is done with clean water until the coffee beans are clean

*Drying*

The cleaned coffee beans were cooling and dried using a solar dryer. Drying was aimed at reducing the water content of coffee beans to < 12.5%, in accordance with SNI 01-2907-2008 standards, i.e., a maximum of 12.5%. The drying process takes 7-10 days, depending on the weather and environmental conditions (temperature and humidity). After drying, coffee beans are called HS (Hard Skin) coffee beans. These coffee beans still contain hard skin. If the HS coffee beans have a water content of around 12.5%, the hard skin will be easily separated using a huller machine.

*Hulling*

The HS coffee beans are then peeled using a huller machine. Separated the hard skin from coffee beans will be produced coffee beans without the hard skin but still containing the silver skin. These coffee beans are sold on the market and have a long shelf life of several years, provided the storage conditions are maintained in accordance with the operating procedures.

*Packaging*

The coffee beans are then packaged in plastic sacks and gunny bags. The packaging size used is adjusted to the weight of the coffee beans to be packaged. Each package contains 25 kg of coffee beans.

*Storage*

Storage technology becomes essential because, during storage, damage and loss are often caused by various factors. However, some aspects are beyond the storage step's control. The uncontrol temperature and humidity during storage can impacts on the quality of the coffee beans. (10) found that green coffee is stored for a prolonged time, its quality decreases, expressed by a typical flattening and slackening of the cup quality as well as reduction in the aroma potential in the green bean (11). (12) reported that stored coffee beans in warehouses with a standard reference temperature of 19°C−27°C and humidity of 60 %−70 %.

### ***2.3. Optimizing digital business management***

Each business has a target to increase product sales. The increase in the target and volume of market products was influenced by the marketing strategy under which it was carried out. Digital business marketing, based on research, is better than conventional marketing because it enables faster market targeting and wider product market access. Moreover, provides greater profits and benefits, and help the business grow and survive. In the case of Triguna Karya group, it was found that the group's members lack sufficient knowledge and skills, especially in digital marketing applications and their use.

To address the lack of knowledge and skills, the farmers' group needs support from the University and other stakeholders to develop solutions. Regarding the community service activity conducted in the group, some strategies were created, such as providing the group with theory on optimising the use of digital business management and on how to practice applying social media to promote their coffee products. Several social media that used for marketing such as Instagram and Facebook. Instagram is preferred for online marketing because it allows for visually appealing photos. Otherwise, there is an instastory menu that producers can use to classify product varieties, making it easier for consumers to search.

During the transfer of theory and skill, the participants appear active, as indicated by discussion. In general, participants understand social media, especially Facebook, but are less knowledgeable about using Instagram and TikTok. The farmers'

group does not yet have proper management and administration, especially regarding entry, input, and output data for sales. The marketing and promotion strategy for the coffee product needs to consider some social media requirements, such as the website's quality and trust, which are used for both marketing and selling the coffee products. Some pictures of social media promotion and marketing were shown in Figures 1 and 2.

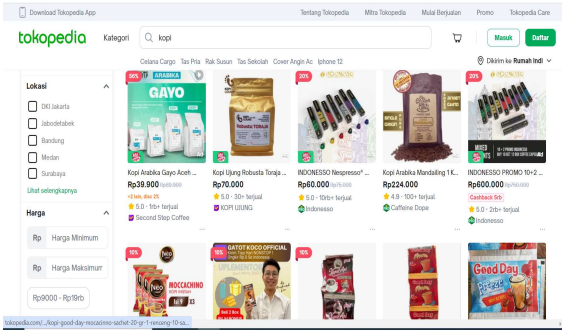


**Figure 1**. Marketing in tokopedia


**Figure 2.** Marketing using social media

## 3. RESULT AND DISCUSION

### *3.1. Exiting Condition*

The community service activity was attended by twenty (20) participants, comprising sixteen members of the Triguna Karya group and four members of the community service committee. The activity was conducted at Triguna Karya Group in Catur Village, Kintamani, Bangli Regency, on June 17, 2024. This activity consists of two steps. The first step was conducted on June 17, 2024, and the second step will be conducted in September 2024. In the second activity will invite expert as a speaker from Chiang May University, Thailand.

Two topics of material were provided to participants during the community service activity, namely green bean storage technology and digital-based business management. Both topics were presented by speakers from Universitas Warmadewa who are experts in Agricultural Technology and Economic Business Management. The speakers presented their papers directly (oral presentation) and practised after sharing the theory. Generally, most participants have good capability in handling green coffee beans, especially from harvesting coffee cherries to processing green beans. However, they don't have the knowledge and skills to properly store green beans. Based on this condition, some participants asked how to handle green beans during storage to maintain quality and safety. These discussions indicated that the participants were very enthusiastic and eager to join the community service. This condition was also found during the transfer of knowledge and skills in digital-based business management in the second session.

Basically, the participants have understood digital management and marketing, especially Facebook and social media. Meanwhile, they lack knowledge and skills in other social media such as Instagram and TikTok. Based on this problem, the speaker from economics and business management provides a theoretical focus on how to use Instagram and TikTok and their benefits. In the last session, there was discussion about allowing participants to ask what they did not understand. According to the discussion showed that most of them not know about how to use the Instagram and tiktok application. The speaker focused on explaining the Instagram and TikTok applications and on increasing human skills in management and digital marketing strategy. There are some steps should be followed namely:

- Introduction to business management using digital systems
- Providing theory and practice of creating bookkeeping and reporting administration with digital systems
- Providing digital marketing theory and practice
- Discussion or question and answer session between group administrators and resource persons
- Independent practice related to creating bookkeeping, reporting and marketing administration with digital systems

After completing the transfer of theory, continue practising in the warehouse where the green beans are stored. In this warehouse, the speaker explained and discussed good storage technical practices for green beans. Based on observations in the warehouse, no tools for measuring environmental temperature and humidity were found. Moreover, in the warehouse, any machine, such as a car or a motorbike, was also found that can affect the quality and safety of green beans during storage. According to the standard, in the warehouse only green beans can be stored; meanwhile, other items can be stored in the same room because green beans can absorb environmental odours and water vapour, which can increase their moisture content.

Based on several research stated that moisture content is an important attribute and an indicator of quality, especially for coffee sellers and roasters. The low quality of coffee at the farm level is mainly caused by post-harvest problems encountered in the field, including high water content, which can trigger mould growth, thereby affecting the final taste and lowering the selling price (13). According to (14), a water content of 12% with a tolerance of 1% is a limit that can guarantee safety during storage. Meanwhile, coffee beans with a water content below 9% (too dry) will damage taste and colour (14). The water content of coffee beans after the drying process and before storage should be <14%. It is feared that storing coffee beans with a moisture content above 14% will cause the growth of ochratoxin-producing mold (15). Based on the research by (16) found that storage of green beans at temperature 27-30ºC °C for five weeks still has good qualities. After packaging the green beans, continue storage in place/room or in a warehouse at 27-30ºC. This temperature should be kept stable; therefore, a temperature controller is needed in the warehouse. The farmers in the group can check the temperature and humidity periodically to monitor the temperature conditions.The discussion with the management of the Triguna Karya group and the community service activities are shown in Figures 3, 4, and 5.


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**Figure 3**. Discussion of Topic with Tri Guna Karya Management

**Figure 4**. Presentation of Materials by First speakers to the participants

**Figure 5**. Presentation of Materials by the Second speaker to the participants

***3.2 Technology Product, Innovation and Application***

Based on the community service applied, participants in general have good knowledge and skills, especially in postharvest and coffee processing. As employees do not process coffee, they only sell coffee cherries; therefore, they do not need to process. To produce high-quality coffee products, the owner can educate and train employees. The farmers who were employees sold their coffee cherries to the owner at a reasonable price. The transfer of knowledge and skills provided to the farmers' group focused on storage technical methods for coffee beans and digital business management. Innovation was also introduced during community service activity. Provision of good storage practices for coffee beans was provided to the farmers' group. In fact, the green beans are stored with good standard operating procedures, but under certain conditions, it is necessary to control the room temperature and humidity. Moreover, there was not tool for temperature and humidity control in warehouse. In the warehouse, it is not recommended to store anything other than green beans, as this can affect coffee quality and odour, as coffee has a hygroscopic characteristic. When green bean storage was conducted according to standard operating procedures, especially at the correct temperature and humidity, and under controlled sanitation conditions, the quality of green beans was maintained and safety improved. The shelf life of the green beans can be increased. The practice of technical storage for green beans in the warehouse showed in Figure 6 and Figure 7.

**Figure 6**. Practicing of technical storage for green beans in warehouse

**Figure 7.** Dicussion of technical storage for green beans in warehouse with expert from Chiang Mai University-Thailand

Using social media such as web profiles, Instagram, and Facebook can help the farmers' group increase the market for coffee products and shellings (Figure 3.6). However, improving of knowledge and skill of the farmers group is essential to involve. Educating and training participants during community service can help increase their ability to use social media to promote and sell green beans. Low education level of farmers group cause the transfer skill of social media was slow therefore need more times to increase it faster


Figure 8. . Using social media to promote and sell coffee products

### *3.3. Impact and Productivity*

Based on the results of the community service, in general, the Triguna Karya group has responded well and is very enthusiastic about conducting the service. Improving Storage Technique for Coffee Green Beans and the Application of Digital Management Business in "Tri Guna Karya" Catur Village, Kintamani, Bangli are topics relevant to the existing problem found in the group.

Moreover, several benefits obtained by participants and the Triguna Karya group through this community are 1) increasing the knowledge and skill of the group members in terms of storage techniques of green beans, and 2) improving the social media knowledge and skill of the farmers' group. The improvement and expansion of both knowledge and skills can help the Triguna Karya group maintain the quality and safety of green coffee beans during storage. Good-quality green beans can be sold at a reasonable price, stored longer, and consumed safely. However, the Triguna Karya group needs to keep the warehouse clean and sanitised, and avoid bed odour in the environment. Furthermore, in the warehouse, tools such as thermometers are needed to control temperature and humidity.

Regarding the topic of digital business management, the farmers' group was very enthusiastic. They thought that in competitive situations, business management skills are needed, such as using social media platforms like Instagram, TikTok, and Facebook. Wider use of social media by Triguna Karya will increase access to promotion and the market target. The quality of coffee products and the marketing strategy became the main priorities for the farmers' group.

Sales of green beans and coffee products will increase when the farmers' group implements green bean storage techniques, which help maintain the quality and safety of the beans. Moreover, they have to use more social media to promote and sell their products.

### *3.4. Output Achievement*

According to the community service, some outputs were achieved, including increased knowledge and skills among Triguna Karya members in green bean storage techniques. Increasing both capabilities can reduce the damage to green coffee beans during storage, thereby minimising profit loss. Storing green beans at the correct temperature and humidity will prevent increased water content, which can affect their safety and shelf life. Moreover, the group also has good knowledge and skills in using social media such as Instagram and TikTok, even though they also use Facebook. Increased use of social media will boost sales of the shell coffee product and expand its market. Furthermore, some outputs from this community service, namely a YouTube video, online news, an article draft, and an Intellectual Property Right, will be achieved next month.

## 4. CONCLUSION

Regarding the results of the community service conducted at Triguna Karya group in Catur village, Kintamani, Bangli regency, several conclusions and recommendations were drawn, including: In general, the level of participation of managers and group members in implementing community service activities from the preparation stage to implementation is high and enthusiastic. Group members already have knowledge and skills in good post-harvest handling and processing of coffee according to GMP, but have not properly implemented green bean storage in accordance with standards. The Triguna Karya group has used social media, such as Facebook, to market and promote its coffee products. Still, it has not been optimal because several other social media platforms, such as Instagram and TikTok, have not been used. The Triguna Karya group still needs assistance and support, especially in green bean storage techniques, using social media more effectively, expanding collaborative relationships (networking) with various parties, and carrying out promotions.

There are some recommendations to improve the coffee business in Tri Guna Karya: 1) to maintain the quality and safety of green beans during storage, the group needs to complete the storage warehouse with a thermometer therefore the temperature and humidity conditions can be known and controlled. 2) In the coffee bean storage room, the group must not store other objects that can produce odors and affect the quality of the coffee beans in the room. 3). to increase market access and sales volume of coffee products, the Triguna Karya group needs to continue to promote and collaborate with various parties, especially buyers and travel agents and 4) the Triguna Karya Group must actively collaborate with various parties, especially assistance activities from universities, the government and the private sector therefore solutions can be found for the problems and the coffee business can continue to develop and progress based on the expectations.

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